



NTSB Investigation Hearing 787 Li-Ion Battery Panel 1 — Selection and Certification Criteria

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Safety Is Boeing's Top Priority

- Flying is the safest method of travel.
- Industry, FAA and NTSB continue to pursue improvements.
- The 787 followed the same design philosophy that made all other Boeing models safe.
- Continuous review of performance contributes to the safety of air travel.



Together We Ensure Safety With an Unwavering Commitment

Boeing 787 Overview

**Enhanced
Flight Deck**

**More-Electric
System
Architecture**

**Passenger-Pleasing
Features**

**Next-
Generation
Engines**

**Advanced
Aerodynamics**

**Composite
Primary
Structure**



Technologies Leveraged to Deliver Value

Rigorous Tier 1 Supplier Selection Process

- **Potential suppliers supported initial development work.**
- **Assessment criteria included:**
 - Technical expertise and experience.
 - Quality assurance and product safety.
 - Demonstrated production capabilities.
 - Engagement and collaboration.
- **The assessment process included:**
 - Site visits.
 - Proposals submitted.
 - Extensive evaluation.

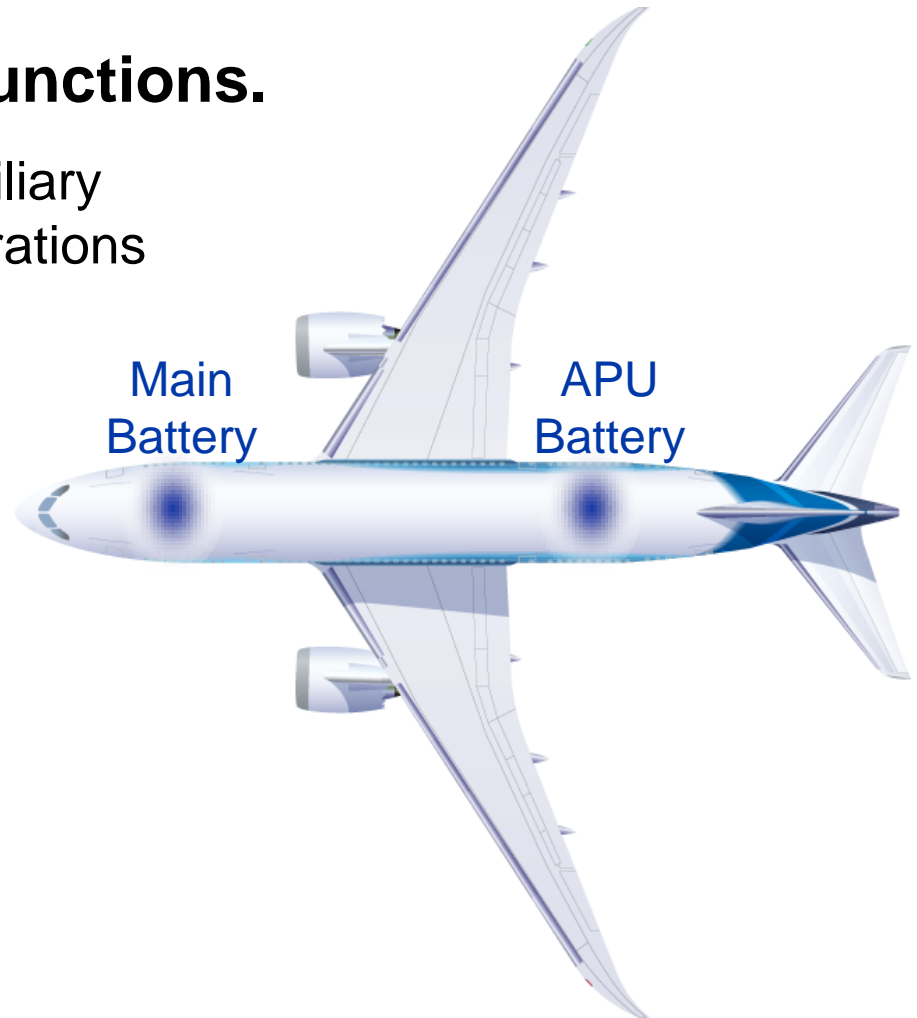


Boeing Safety Philosophy Underlies Supplier Selection

787 Lithium-Ion Batteries

- **Batteries perform limited functions.**

- Primary function: on-ground auxiliary power unit start and ground operations
- Secondary function: in flight, one of multiple sources of backup power



Batteries Not Needed for Safe Flight or Landing

Why Lithium Ion?

- Requirements included:
 - Safety.
 - Power capability.
 - Charging characteristics.
 - Storage capacity.
 - Low weight.
- Technologies evaluated:
 - Nickel cadmium.
 - Lithium cobalt.
 - Lithium manganese.

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Feature	Lithium Ion (Lithium Cobalt)	Nickel Cadmium
Voltage	32V	24V
Maximum weight	63 lb	107 lb
Current provided for power-up	150 amps	16 amps

Lithium Ion Best Suited for 787 Requirements

FAA Oversight

- The FAA defined the certification requirements for the battery.
- The FAA provided rigorous oversight of the development process.
 - The FAA retained approval of standards, methods of compliance and safety items.
 - The FAA was closely involved, reviewing requirements, test procedures and results.
- FAA involvement and safety assessment continue after the type certificate is issued through the FAA-Boeing continued operational safety process.



FAA Involved Throughout Product Lifecycle

Special Condition and Issue Paper

- **The FAA applied the Special Condition to models built by several manufacturers.**
- **The FAA sent Issue Paper SE-9 to Boeing in June 2005.**
- **Boeing responded to the issue paper in December 2005.**
 - Boeing agreed with the FAA's draft Special Condition and proposed how compliance would be shown.
 - The FAA modified one requirement, regarding flight crew indication of battery capacity, based on Boeing's input.

FAA Issued the Special Condition in 2007

Certification of the Boeing 787

- The 787 certification effort was the most extensive in Boeing's history.
- Lithium-ion battery certification was rigorous and subject to close FAA oversight.
- Certification validated that the 787 is safe and reliable.



August 26, 2011 — 787 Achieves Certification

Summary

- Boeing, other manufacturers, the FAA and the NTSB have worked together to create the safest transportation system in the history of the world.
- The 787 continues this proud legacy — it encompasses more than 65 years of jet airplane design expertise and lessons learned.
- The 787 was certified following the most rigorous test and certification program in the history of commercial air transportation.
- Lithium-ion batteries are the right choice for the 787 architecture, based on thorough technical assessments.
- Boeing worked closely with its suppliers and the FAA to demonstrate that the battery complied with all applicable Boeing and regulatory requirements.
- We have learned from the January events, which were not acceptable. We have developed a comprehensive set of solutions.
- Safety remains our highest priority.

Thank You for the Opportunity to Discuss This Subject



Backup

787 Battery Timeline

